

Space Weather Technical Forecast

Issued on Friday, 10 June 2022 at 01:16 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales <https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales>

Space Weather Forecast Headline: Increasing chance of M-class flares.**Analysis of Space Weather Activity over past 24 hours**

Solar Activity: Solar activity has been Low, with several low level C-class flares observed. Two of these flares originated from AR3029, a region now in the southwest quadrant, and the only numbered region on the visible disc. This region temporarily increased in size and complexity, but has recently decayed slightly. The remaining C-class flares were thought to have emanated from a region which rotated onto the visible disc and is now in the northeast quadrant. However, just behind this yet to be numbered region in the northeast quadrant, which appears small and magnetically simple, another larger region appears to be following and currently emerging onto the northeast limb. This newest region produced the remaining C-class flares, and may be a return of persistent region ex-AR3014, which generated significant activity on two previous rotations. A further new region, a very faint, weak and simple region, has also emerged within the southeast quadrant. A CME which left the northwest Sun late on 08 June has been analysed as not being Earth directed. No further CME's have been observed in available imagery.

Solar Wind / Geomagnetic Activity: The solar wind, observed by DSCOVR at L1 has been at ambient levels, currently averaging around 300km/s. Density has been predominantly just above average, after a slowly rising trend at the start of the period. Total interplanetary magnetic field strength has been weak, peaking at 7nT, with the north-south component generally weakly negative. Phi angle was positive (away from the Sun) until 09/0600 UTC, thereafter generally negative (towards the Sun). Geomagnetic activity was Quiet (Kp 1-2).

Energetic Particles / Solar Radiation: The high energy proton flux (10 MeV) has been at background levels. Electron flux (greater than 2MeV) has been predominantly at background levels, occasionally reaching Moderate levels, with a peak of 206 pfu. Electron fluence has been well below the Active (1e8 integrated pfu) threshold, with 1.55e6 integrated pfu recorded at 10/0000 UTC on a gently increasing trend.

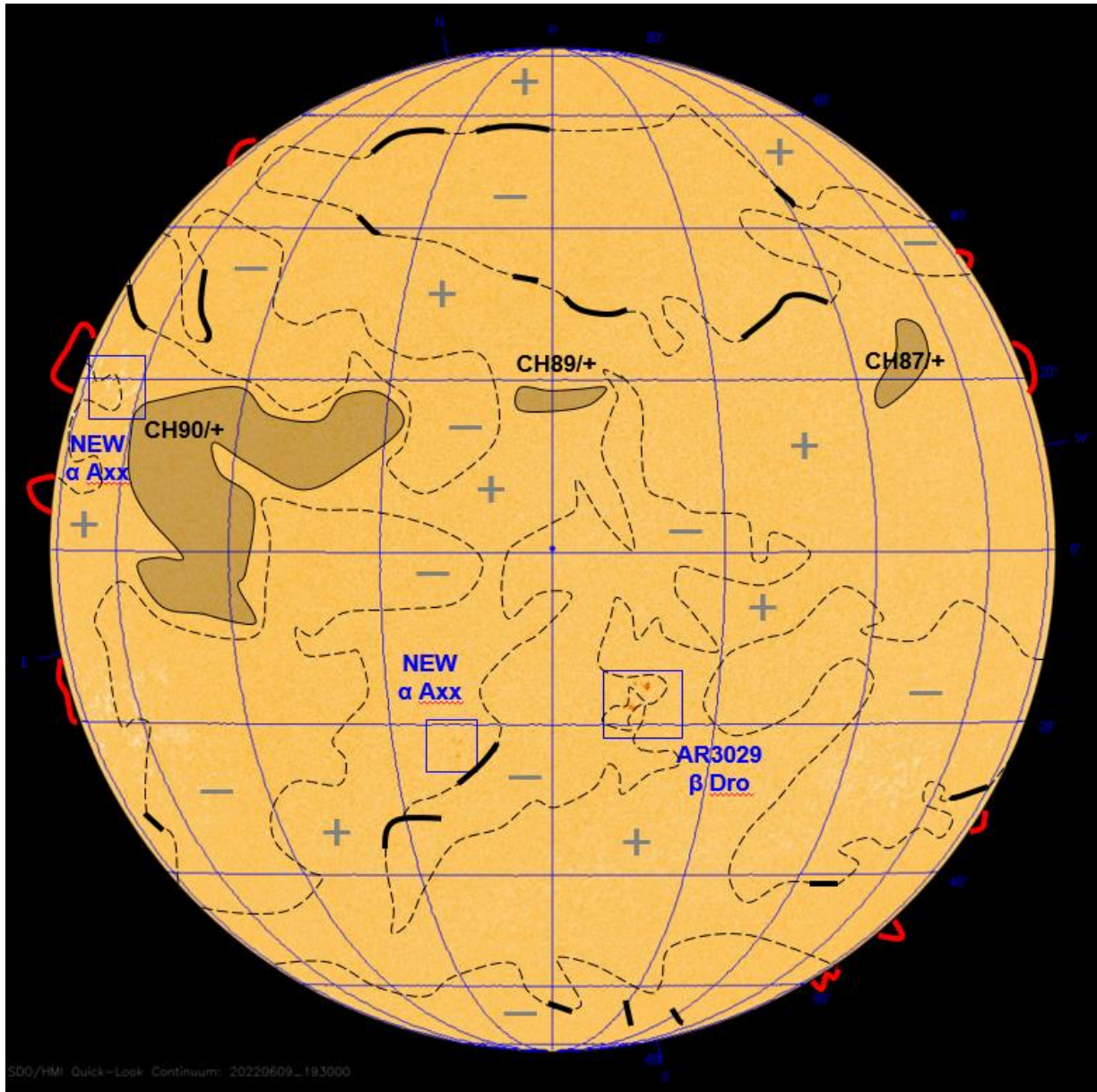
Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is expected to start mainly Low with occasional C-Class flares, but with an increasing chance of M-Class flares due to the returning region that currently emerging onto the northeast limb, plus other regions which may rotate onto the visible disc through the forecast period.

Solar Wind / Geomagnetic Activity: No Earth-directed CMEs are currently forecast. A coronal hole may connect with the Earth today, but as the feature is very small and weak on only slightly elevated winds are expected. Geomagnetic activity is forecast to be mainly Quiet (Kp 0-2) with a chance of isolated Unsettled (Kp 3) intervals today and overnight.

Energetic Particles / Solar Radiation: High energy proton flux (greater than 10 MeV) is expected to be at background levels during this period. High energy electron flux (greater than 2 MeV) is expected to vary between background and perhaps moderate levels. Electron fluence is expected to remain below the Active threshold throughout, with probably a gentle upward trend in fluence levels.

Figure 1. Solar Analysis Valid 09/1930 UTC.



Key: Filament ____, Prominence ____, Magnetic Field Line - - -, Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-γ-δ and Zurich-McIntosh Axx etc.

Geomagnetic Storms:

There are no Earth-directed CMEs forecast, as a CME which left the northwest quadrant of the Sun late on 08 June has been modelled as not being Earth directed.

Solar winds are expected to be at mainly background levels throughout the forecast period.

There is a chance of a slight enhancement, due to a high speed stream from coronal hole 87, today (10 June) with speeds of 400-450km/s possible. However, due to the proximity of the solstice and because CH87 is small and weak, any resultant geomagnetic activity is expected to be muted.

Geomagnetic activity is expected to be mainly Quiet (Kp 0-2) with a chance of isolated Unsettled (Kp 3) intervals today and overnight.

Geo-Magnetic Storm	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Minor or Moderate	G1 to G2	No	1	1	1	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X-Ray Flares:

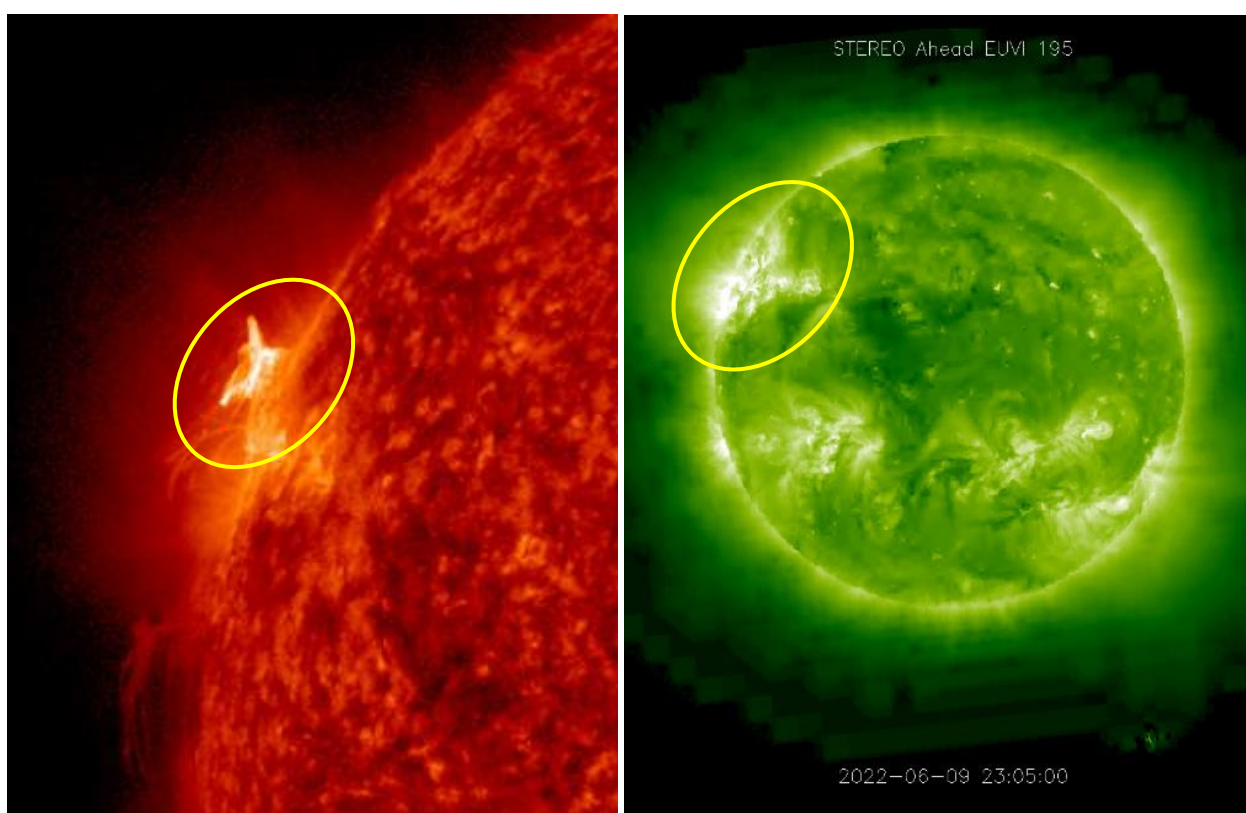
Solar activity has been Low, with several low level C-class flares observed. Two of these flares originated from AR3029, a region now in the southwest quadrant, and the only numbered region on the visible disc. This region temporarily increased in size and magnetically complexity, but has recently decayed slightly, becoming a relatively weak and small Dro/beta group. The remaining C-class flares were originally thought to have emanated from a region which rotated onto the visible disc and is now in the northeast quadrant. However, just behind this yet to be numbered region in the northeast quadrant, which appears small and magnetically simple, another larger region appears to be following and currently emerging onto the northeast limb. This newest region has produced the remaining C-class flares, including the recent long duration C2.6 flare, the largest flare during the past 24 hours. This emerging region may be a return of persistent region ex-AR3014, which generated significant activity on two previous rotations. A further new region, a very faint, weak and simple region, has also emerged within the southeast quadrant.

Solar activity is expected to start mainly Low with occasional C-Class flares, but with an increasing chance of M-Class flares due to the returning region that currently emerging onto the northeast limb, plus other regions which may rotate onto the visible disc through the forecast period.

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
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Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	No	5	10	15	15
Very Active	R3 to R5 X Class	No	1	1	1	1

Figure 2: Left SDO AIA 304 image showing the recent long duration C2.6 flare. Originating on or just behind the northeast limb. Right – STEREO Ahead 195 image showing potential regions on or behind the northeast limb.



Solar Radiation Storms - (High Energy Protons):

The high energy proton flux (greater than 10 MeV) is at background levels. It is expected to remain at this level through the period in the absence of significant sunspot regions in the western hemisphere.

Radiation Storms	Level ($\text{cm}^{-2} \text{sr}^{-1} \text{s}^{-1}$)	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	$\geq \text{S1}$	No	1	1	1	1
Very Active	$\geq \text{S3}$ *	No	1	1	1	1

* S3 $\geq 10 \text{ MeV} \geq 1000 \text{ pfu}$ and / or $\geq 50 \text{ MeV} \geq 10 \text{ pfu}$. (pfu = $\text{cm}^{-2} \text{sr}^{-1} \text{s}^{-1}$)

High Energy Electrons Event ($\geq 2 \text{ MeV}$):

High energy electron flux (greater than 2MeV) is expected to remain at mainly background to moderate levels through the next four days. There may be a slightly rising trend in the diurnal peak during the period should the Earth connect with the weak coronal hole 87. Corresponding electron fluence values are also expected to remain below the Active (1×10^8 integrated pfu) throughout, with a steady or possibly gently increasing trend.

The Met Office REFM model supports the fluence remaining well below the Active threshold, but shows a decreasing trend, which is considered unlikely.

GEO Electron Environment	Level ($\text{cm}^{-2} \text{sr}^{-1} \text{day}^{-1}$)	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	$\geq 2 \text{ MeV}$ $\geq 1 \times 10^8$	No	1	1	5	10
Very Active	$\geq 2 \text{ MeV}$ $\geq 1 \times 10^9$	No	1	1	1	1

Figure 3: Met Office REFM model.

